

Practitioner's Docket No. 50353 (70329)

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Pandya et al.
Application No.: 09/228,694
Filed: January 12, 1999
For: HYDROXYPHENYL COPOLYMERS AND PHOTORESISTS COMPRISING SAME

Group No.: 1752
Examiner: S. Lee

Assistant Commissioner for Patents
Washington, D.C. 20231

TRANSMITTAL OF APPEAL BRIEF
(PATENT APPLICATION-37 C.F.R. SECTION 1.192)

1. Transmitted herewith, in triplicate, is the APPEAL BRIEF in this application, with respect to the Notice of Appeal filed on October 1, 2001.

NOTE: "Appellant must, within two months from the date of the notice of appeal under section 1.191 or within the time allowed for reply to the action from which the appeal was taken, if such time is later, file a brief in triplicate....." 37 C.F.R. Section 1.192(a) (emphasis added)

2. STATUS OF APPLICANT

This application is on behalf of

☒ other than a small entity.
☐ a small entity.

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APR 11 2002
TC 1700

CERTIFICATE OF MAILING/TRANSMISSION (37 C.F.R. SECTION 1.8(a))

I hereby certify that, on the date shown below, this correspondence is being:

MAILING

☒ deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Date: 4/1/02

FACSIMILE

☐ transmitted by facsimile to the Patent and Trademark Office (703) ____-____.

Signature

Peter F. Corless

(type or print name of person certifying)

04/09/2002 JADD01 00000009 09228694

02 FC:118

1440.00 OP

(Transmittal of Appeal Brief--page 1 of 3)

3. FEE FOR FILING APPEAL BRIEF

Pursuant to 37 C.F.R. Section 1.17(c), the fee for filing the Appeal Brief is:

☐ small entity \$155.00

☒ other than a small entity \$320.00

Appeal Brief fee due \$ 320.00

4. EXTENSION OF TERM

NOTE: The time periods set forth in 37 C.F.R. 1.192(a) are subject to the provision of Section 1.136 for patent applications. 37 C.F.R. 1.191(d). See also Notice of November 5, 1985 (1060 O.G. 27).

NOTE: As the two-month period set in Section 1.192(a) for filing an appeal brief is not subject to the six-month maximum period specified in 35 U.S.C. 133, the period for filing an appeal brief may be extended up to seven months. 62 Fed. Reg. 53,131, at 53,156; 1203 O.G. 63 at 84. Oct. 10, 1997.

The proceedings herein are for a patent application and the provisions of 37 C.F.R. Section 1.136 apply.

(complete (a) or (b), as applicable)

(a) ☒ Applicant petitions for an extension of time under 37 C.F.R. Section 1.136 (fees: 37 C.F.R. Section 1.17(a)(1)-(5)) for the total number of months checked below:

Extension (months)	Fee for other than small entity	Fee for small entity
<input type="checkbox"/> one month	\$110.00	\$ 55.00
<input type="checkbox"/> two months	\$400.00	\$195.00
<input type="checkbox"/> three months	\$920.00	\$445.00
<input checked="" type="checkbox"/> four months	\$1,440.00	\$695.00
<input type="checkbox"/> five months	\$1,960.00	\$945.00

Fee \$ 1,440.00

If an additional extension of time is required, please consider this a petition therefor.

(check and complete the next item, if applicable)

☐ An extension for _____ months has already been secured, and the fee paid therefor of \$ _____ is deducted from the total fee due for the total months of extension now requested.

Extension fee due with this request \$ _____

or

- (b) ☐ Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

5. TOTAL FEE DUE

The total fee due is:

Appeal brief fee \$ 320.00

Extension fee (if any) \$ 1,440.00

TOTAL FEE DUE \$ 1,760.00

6. FEE PAYMENT

☒ Attached is a check in the sum of \$ 1,760.00

☐ Charge Account No. _____ the sum of \$ _____.

A duplicate of this transmittal is attached.

7. FEE DEFICIENCY

NOTE: If there is a fee deficiency and there is no authorization to charge an account additional fees are necessary to cover the additional time consumed in making up the original deficiency. If the maximum six-month period has expired before the deficiency is noted and corrected, the application is held abandoned. In those instances where authorization to charge is included, processing delays are encountered in resuming the papers to the PTO Finance Branch in order to apply these charges prior to action on the cases. Authorization to change the deposit account for any fee deficiency should be checked. See the Notice of April 7, 1986, 1065 O.G 31-33.

☒ If any additional extension and/or fee is required, this is a request therefor and to charge Account No. 04-1105

AND/OR

☒ If any additional fee for claims is required, charge Account No. 04-1105.



SIGNATURE OF PRACTITIONER

Reg. No. 33,860

Peter E. Corless
(type or print name of practitioner)

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Docket No. 50353

THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Pandya et al.

SERIAL NO.: 09/228,694

GROUP: 1752

FILED: January 12, 1999

EXAMINER: S. Lee

FOR: HYDROXYLPHENYL COPOLYMERS AND PHOTORESISTS
COMPRISING SAME

THE HONORABLE COMMISSIONER OF PATENTS AND TRADEMARKS
WASHINGTON, DC 20231

SIR:

APPEAL BRIEF

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Applicant respectfully appeals the decision of the Examiner, dated March 29, 2001,
finally rejecting claims 1-34.

This brief is being filed in triplicate. The requisite fee for filing this brief is enclosed
herewith.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is the Shipley Company, L.L.C., the assignee of the application.

II. RELATED APPEALS AND INTERFERENCES

To the knowledge of the undersigned, there are no current appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-34 have been presented in this application.

Claims 1-34 are presently on appeal (see the attached Appendix).

IV. STATUS OF AMENDMENTS (AFTER FINAL REJECTION)

No amendments have been filed after final rejection.

V. SUMMARY OF THE INVENTION

Brief background of technical field

Photoresists are photosensitive films for transfer of images to a substrate. After coating a photoresist on a substrate, the coating is exposed through a patterned photomask to a source of activating energy to form a latent image in the photoresist coating. A relief image is provided by development of the latent image pattern in the resist coating. See application at page 1.

For high performance applications, such as manufacturing of microelectronic wafers, the need exists for new photoresists that can provide highly resolved images of submicron dimension. See page 2 of the application.

Summary of Appellant's Invention

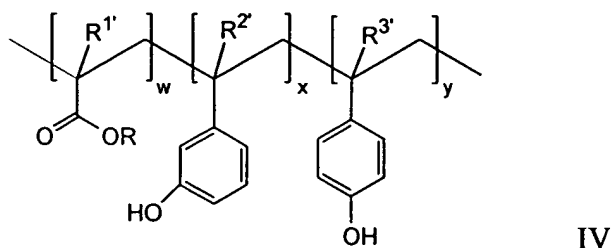
Appellant has discovered photoresists that contain copolymers that comprise: at least one repeating unit that is a meta-hydroxyphenyl derivative; at least one repeating unit that is a para-hydroxyphenyl derivative; and one or more photoacid labile groups. See page 2, last paragraph of the application.

Appellant's independent claims 1 and 24 are representative of the subject matter on appeal and read as follows:

Claim 1. A photoresist composition comprising a photoactive component and a resin that comprises a polymer that comprises 1) an acid labile groups; 2) a meta-hydroxyphenyl group; and 3) a para-hydroxyphenyl group, wherein the meta-hydroxyphenyl group has a single meta-hydroxy moiety and is unsubstituted at other available ring positions.

Claim 24. A photoresist composition comprising a photoactive component and a resin that comprises a polymer that comprises 1) an acrylate acid labile group; 2) a meta-hydroxyphenyl group; and 3) a para-hydroxyphenyl group.

Preferred polymers of the invention have repeating units that have a single moiety on the meta-hydroxy-phenyl group. See page 4, lines 1-4; and page 5, last two lines of the application. Acrylates are preferred acid labile groups, such as tert-butyl acrylate. Particularly preferred photoresists of the invention contain a polymer that comprises a structure of the following Formula IV:



Appellant discovered that addition of a meta-hydroxyphenyl unit to a polymer containing para-hydroxyphenyl units and acid-labile units can quite favorably impact dissolution rates and solubility differentials between exposed and unexposed regions of a resist coating layer that contains the polymer. See page 3, first paragraph of the application.

Such properties exhibited by photoresists of the invention can enable formation of highly resolved resist images. Resists of the invention that have too high of a dissolution rate can exhibit relatively decreased resolution when printing sub-micron features. See the application at page 3, first paragraph.

Such results also are demonstrated by the data set forth in the **Rule 132 Declaration of Dr. Pandya**. That Declaration is of record, with a further copy attached.

Dr. Pandya's Declaration details significantly reduced dissolution rates provided by polymers of the invention that include meta-hydroxyphenyl units, relative to comparable polymers that do not include meta-hydroxyphenyl units. As mentioned, such reduced dissolution rates can provide significantly enhanced lithographic performance of a photoresist that contains the polymer. See page 3, first paragraph of the application.

ISSUES

1. Whether claims 1-34 are unpatentable under 35 U.S.C. §103 over Watanabe et al. (U.S. Patent 5,844,057).
2. Whether claims 1-34 are unpatentable under 35 U.S.C. §103 over Urano et al. (EP 0 780 732 A2).
3. Whether claims 17-18 are unpatentable under 35 U.S.C. §103 over Watanabe et al. (JPO abstract: JP406049137A and Derwent abstract: 1994-097835 –English language abstract of JP 06049137A).
4. Whether claims 1, 3, 5 and 13-16 are unpatentable under 35 U.S.C. §103 over Watanabe et al. (JPO abstract: JP406049137A and Derwent abstract: 1994-09735 – English abstracts of JP 06049137A) in view of Watanabe et al. (U.S. Patent 5,844,057)
5. Whether claims 23, 27 and 29 are unpatentable under 35 U.S.C. 112, second paragraph.

VII. GROUPING OF THE CLAIMS

The rejected claims do **not** stand or fall together since each claim is considered separately patentable in its own right.

Appellant believes that all of the claims under appeal are separately patentable for the reasons set forth in the argument section which follows.

VIII. ARGUMENT

For the sake of brevity, Appellant addresses the several Section 103 rejections on appeal in combination.

i) Cited documents clearly fail to teach or suggest Appellant's claimed invention.

The cited documents simply fail to teach or suggest Appellants' claimed invention.

Among other things, the Watanabe document (U.S. Patent 5,844,057) reports polymers that have *multiple* ring substitution. See columns 23 through 30 of U.S. Patent 5,844,057.

In contrast, Appellant's independent claim 1 specifically recites *meta-hydroxyphenyl group has a single meta-hydroxy moiety and is unsubstituted at other available ring positions*.

Nor does the Watanabe document suggest polymers that contain an acrylate acid labile group as recited in Appellant's independent claim 24. Rather, the Watanabe document reports linking acid labile onto phenolic groups.

The Urano document is even less pertinent than the Watanabe citation.

Indeed, Urano merely provides a general report of phenolic polymers. The examples of the Urano documents do not include a polymer having meta-substitution.

In the final Office Action, it appears acknowledged that Watanabe et al. JP406049137A is even further removed from the Watanabe U.S. Patent 5,844,057. See page 11 of the Office Action. In any event, that Japanese documents does not teach or suggest polymers having meta-hydroxyphenyl as Appellant claims.

See also Section 2143.03 of the Manual of Patent Examining Procedure: "To establish *prima facie* obviousness, all the claim limitations must be taught or suggested by the prior art."

As discussed above, that MPEP mandate is contravened by the instant rejections. None of the documents disclose a meta-hydroxyphenyl group that has a single meta-hydroxy moiety and is unsubstituted at other available ring positions, or that further comprises an acrylate unit, as Appellant claims.

ii) Comparative experimental data of record fully rebuts any *prima facie* case under Section 103 that may be contended to exist.

While Appellant fully believes that a *prima facie* case under Section 103 has not been presented by the cited documents, it is also believed that the comparative data set forth in the application as filed fully rebuts any *prima facie* case that may be contended to exist.

In this regard, attention is directed to the Rule 132 Declaration of Dr. Pandya, of record and copy attached, which demonstrates significant performance differences upon use of a meta-hydroxyphenyl unit in combination with a para-hydroxyphenyl unit as Appellant claims. Such results are clearly not suggested by any of the cited documents.

In the final Office Action, that Declaration is disregarded on grounds that the polymer of the Watanabe was not tested. See page 14 of the final Office Action.

That position does not withstand scrutiny. That is, contrary to the position advanced in the final Office Action, a Declaration **can not** be disregarded merely because additional tests would be desired by the Office. All evidence **must be** considered, particularly in this case, where the evidence of record directly supports patentability. See, for instance, Section 716.01(a) of the Manual of Patent Examining Procedure, which states in part (emphasis added):

Affidavits or declaration containing evidence of criticality or unexpected results **must be** considered by the examiner in determining the issue of obviousness of claims for patentability under 35 U.S.C. 103.

iiii) Each of the claims on appeal are separately patentable.

The documents cited in the rejections on appeal also provide no suggestion of other claimed aspects of Appellant's invention.

For instance, claims 3 and 18 are each separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the photoresist or polymer of claims 1 and 17 respectively where the polymer has a structure represented by the specified Formula I. Clearly none of the cited documents suggest that recited formula. Dr. Pandya's Declaration also demonstrates significant performance results with such polymers.

Claims 6 and 25 are each separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the photoresist of those claims where the polymer has a structure represented by the specified Formula II. Clearly none of the cited documents suggest that recited formula. Dr. Pandya's Declaration also demonstrates significant performance results with such polymers.

Claims 8 and 28 are each separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the photoresist of those claims where the polymer has a structure represented by the specified Formula III. Clearly none of the cited documents suggest that recited formula.

Indeed, Formula III calls for tetrapolymers. Much greater structural similarity has been required to sustain a *prima facie* case under Section 103. See, for instance, *In re Grabiak*, 226 USPQ 870 (Section 103 rejection reversed on basis that *prima facie* obviousness did not exist in view of structural differences between claimed subject matter (thioester) and prior art (ester)). Dr. Pandya's Declaration also demonstrates significant performance results with such polymers.

Claims 10 and 20 are each separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the photoresist of those claims where the polymer has a structure represented by the specified Formula IV. Clearly none of the cited documents suggest that recited formula. Dr. Pandya's Declaration also demonstrates significant performance results with polymers having a structure of Formula IV.

The cited documents also do not suggest methods for forming a photoresist relief image as recited in claims 30 and 31, or a substrate having coated thereon a photoresist of the invention, as recited in claims 32 and 33.

With regards to the Section 112, second paragraph rejection pertaining to matters of form, Appellant is agreeable to amend the pertinent claims to obviate the rejection.

SUMMARY

Therefore, for the foregoing reasons, it is respectfully requested that the Board reverse the final rejection in this application.

Respectfully submitted,



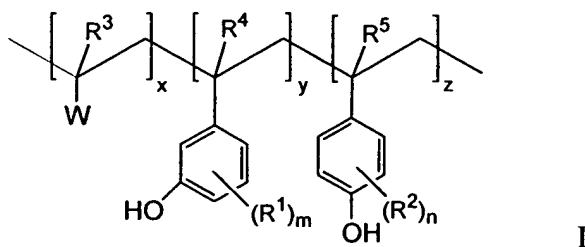
Peter F. Corless (Reg. 33,860)
EDWARDS & ANGELL, LLP
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APPENDIX

1. A photoresist composition comprising a photoactive component and a resin that comprises a polymer that comprises 1) acid-labile groups; 2) meta-hydroxyphenyl groups, and 3) para-hydroxyphenyl groups.

2. The photoresist of claim 1 wherein the copolymer comprises pendant acrylate acid labile groups.

3. The photoresist of claim 1 wherein the polymer is represented by the following Formula I:

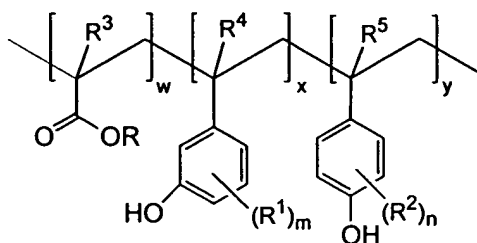


wherein W comprises an acid-labile group;
each R^2 is the same or different non-hydrogen substituents;
 R^3 , R^4 and R^5 are each independently hydrogen or optionally substituted alkyl;
n is 0 to 4; and
w, x and y are each greater than 0 and are the mole percents of the respective polymer units.

4. The photoresist of claim 3 wherein W comprises an acrylate ester.

5. The photoresist of claim 3 wherein the sum of x, y and z is at least about 90 percent.

6. The photoresist of claim 1 wherein the polymer is represented by the following Formula II:



II

wherein R is optionally substituted alkyl having about 4 to about 18 carbon atoms, and is a branched non-cyclic group or an alicyclic group;

each R² is the same or different non-hydrogen substituent;

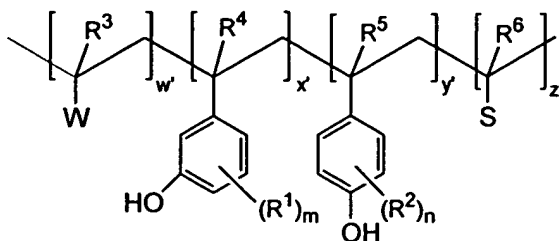
R³, R⁴ and R⁵ are each independently hydrogen or optionally substituted alkyl;

n is 0 to 4; and

w, x and y are each greater than 0 and are the mole percents of the respective polymer units.

7. The photoresist of claim 6 wherein the sum of x, y and z is at least about 90 percent.

8. The photoresist of claim 1 wherein the polymer is represented by the following Formula III:

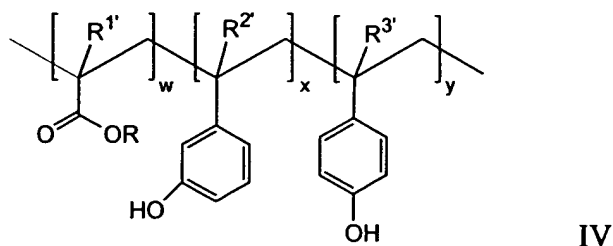


III

wherein W comprises an acid-labile group;
each R^2 is the same or different non-hydrogen substituents;
 R^3 , R^4 , R^5 and R^6 are each independently hydrogen or optionally substituted alkyl;
m and n are each independently 0 to 5; and
S is a group that does not contain acidic or reactive moieties;
 w , x , y and z are each greater than 0 and are the mole fractions or percents of the respective polymer units.

9. A photoresist of claim 8 wherein the sum of x, y and z is at least about 90 percent.

10. A photoresist of claim 1 wherein the polymer is represented by the following
Formula IV:

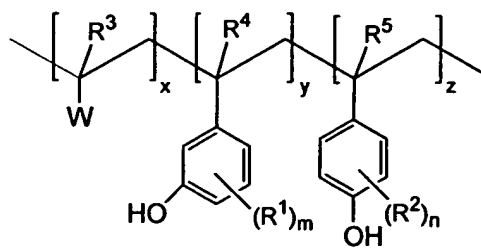


wherein R is optionally substituted alkyl suitably having from 4 to about 18 and is a branched non-cyclic group or an alicyclic group;
 R^1 , R^2 and R^3 are each independently hydrogen or methyl;
 w , x , y and z are each greater than 0 and are mole fractions or percents of the respective units.

11. A photoresist of claim 10 wherein R is tert-butyl group, adamantyl or norbornyl.

12. A photoresist of claim 10 wherein the sum of w, x, y and z is at least about 90 percent.

13. A method for forming a photoresist relief image, comprising:
a) applying a layer of a photoresist composition of claim 1 on a substrate; and b) exposing and developing the photoresist layer on the substrate to yield a photoresist relief image.
14. The method of claim 13 wherein the substrate is a microelectronic wafer of a flat panel display substrate.
15. An article of manufacture comprising a substrate having coated thereon a photoresist composition of claim 1.
16. An article of claim 15 wherein the substrate is a microelectronic wafer or a flat panel display substrate.
17. A polymer that comprises 1) acid-labile groups; 2) meta-hydroxystyrene groups; and 3) para-hydroxyphenyl groups, wherein the meta-hydroxyphenyl groups each has a single meta-hydroxy moiety and is unsubstituted at other available ring positions.
18. A polymer of claim 17 wherein the polymer is represented by the following Formula I:



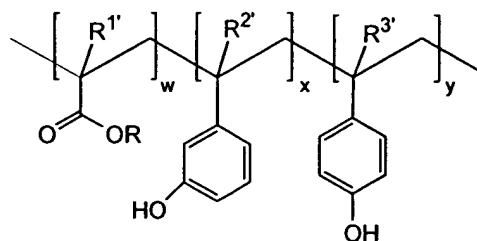
wherein W comprises an acid-labile group;
each R^2 is the same or different non-hydrogen substituents;
 R^3 , R^4 and R^5 are each independently hydrogen or optionally substituted alkyl;

n is 0 to 4; and

w, x and y are each greater than 0 and are the mole percents of the respective polymer units.

19. A polymer of claim 18 wherein W comprises an acrylate ester, and the sum of x, y and z is at least about 90 percent.

20. A polymer of claim 18 wherein the polymer is represented by the following Formula IV:



IV

wherein R is optionally substituted alkyl suitably having from 4 to about 18 and is a branched non-cyclic group or an alicyclic group;

R^{1'}, R^{2'} and R^{3'} are each independently hydrogen or methyl;

w, x, y and z are each greater than 0 and are mole fractions or percents of the respective units.

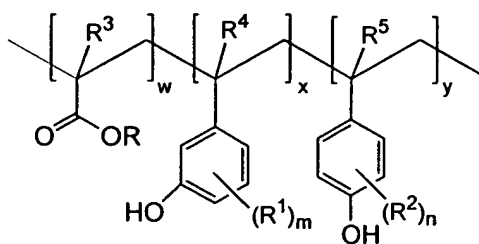
21. A photoresist of claim 6 wherein R is tert-butyl, adamantyl, tetrahydropyranyl or norbornyl.

22. A polymer of claim 20 wherein R is tert-butyl, adamantyl, tetrahydropyranyl or norbornyl.

23. A polymer of claim 20 wherein the sum of w, x, y and z is at least about 90 mole percent of total units of the polymer.

24. A photoresist composition comprising a photoactive component and a resin that comprises a polymer that comprises 1) an acrylate acid labile group; 2) a meta-hydroxyphenyl group; and 3) a para-hydroxyphenyl group.

25. The photoresist of claim 24 wherein the polymer is represented by the following Formula II:



wherein R is optionally substituted alkyl having about 4 to about 18 carbon atoms, and is a branched non-cyclic group or an alicyclic group;

R^1 and R^2 are each the same or different non-hydrogen substituents;

R^3 , R^4 and R^5 are each independently hydrogen or optionally substituted alkyl;

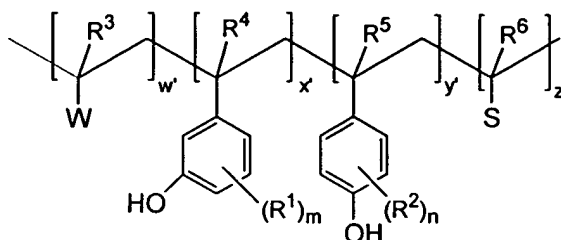
m and n are each independently 0 to 5; and

w, x and y are each greater than 0 and are the mole percents of the respective polymer units.

26. A photoresist of claim 25 wherein R is tert-butyl, adamantyl, tetrahydropyranyl or norbornyl.

27. The photoresist of claim 25 wherein the sum of w, x and y is at least about 90 percent of total units of the polymer.

28. The photoresist of claim 24 wherein the polymer is represented by the following Formula III:



III

wherein W comprises an acrylate acid-labile group;
 R^1 and R^2 are each the same or different non-hydrogen substituents;
 R^3 , R^4 , R^5 and R^6 are each independently hydrogen or optionally substituted alkyl;
 m and n are each independently 0 to 5; and
 S is a group that does not contain acidic or reactive moieties;
 w' , x' , y' and z' are each greater than 0 and are the mole fractions or percents of the respective polymer units.

29. A photoresist of claim 28 wherein the sum of w' , x' , y' and z' is at least about 90 percent of total units of the polymer.

30. A method for forming a photoresist relief image, comprising:
a) applying a layer of a photoresist composition of claim 24 on a substrate; and
b) exposing and developing the photoresist layer on the substrate to yield a photoresist relief image.

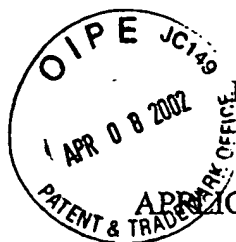
31. The method of claim 30 wherein the substrate is a microelectronic wafer or a flat panel display substrate.

32. An article of manufacture comprising a substrate having coated thereon a photoresist composition of claim 24.

33. An article of claim 32 wherein the substrate is a microelectronic wafer or a flat panel display substrate.

34. A polymer that comprises 1) acrylate acid labile groups; 2) meta-hydroxyphenyl groups; and 3) para-hydroxylphenyl groups.

Docket No. 50353



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SERIAL NO.: 09/228,694 EXAMINER: S. Lee
FILED: January 12, 1999 GROUP: 1752
FOR: HYDROXYPHENYL COPOLYMERS AND PHOTORESISTS
COMPRISING SAME

THE HONORABLE COMMISSIONER OF PATENTS AND TRADEMARKS
WASHINGTON, DC 20231

SIR:

DECLARATION UNDER 37 CFR 1.132

1. I am an inventor on the above-identified application assigned to the Shipley Company and the IBM Corporation. I am employed by the Shipley Company and my current job title is Research Chemist A. I have worked in design and development of photoresist compositions since I commenced employment with the Shipley Company in 1992. I received my Ph.D. degree in Chemistry from Virginia Polytechnic University in 1992.

2. I had prepared the below-specified three copolymers (identified herein as Polymers 1, 2 and 3).

Polymer 1: consisted of 80 mole percent para-hydroxystyrene units and 20 mole percent of tert-butylacrylate units;

Polymer 2: consisted of 70 mole percent para-hydroxystyrene units, 10 mole percent meta-hydroxystyrene units and 20 mole percent tert-butylacrylate units;

Polymer 3: consisted of 50 mole percent para-hydroxystyrene units, 30 mole percent meta-hydroxystyrene units and 20 mole percent tert-butylacrylate units.

Each of Polymers 1, 2 and 3 had a weight average molecular weight of 10,000 daltons.

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Page 2

3. Each of Polymers 1, 2 and 3 were tested for dissolution rates in aqueous alkaline developer. Briefly, for each of Polymers 1, 2 and 3, an ethyl lactate solution of the polymer was spin coated onto a silicon wafer and solvent removed by heating the coated wafer at 130°C for about 60 seconds on a vacuum hotplate. The dried polymer layers were each about one micron in thickness. Dissolution rates of the polymer films were measured by immersion of the coated wafer in 0.26 N tetramethyl ammonium hydroxide aqueous solution and using a Perkin-Elmer 5900 Development Rate Monitor. The following dissolution rates were measured:

Polymer 1: provided a dissolution rate of 1164 angstroms per second;

Polymer 2: provided a dissolution rate 703 angstroms per second;

Polymer 3: provided a dissolution rate of 348 angstroms per second.

4. I further declare that all statements made herein of my own knowledge are true and that all statement made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, and that such willful false statements may jeopardize the validity of the any patent issued from the above-identified application.

Date: 4-25-2000

A. Pandya
Ashish Pandya